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AUTHOR: ⑧ Paal, G.

TITLE: ⑨ On the relativistic theory of the metagalaxy

PERIODICAL ⑩ Astronomicheskiy zhurnal, v.39, No.5, 1962, 911-914

TEXT: It is noted that if existing preliminary observational data on distant galaxies are confirmed by further measurements, and presently accepted cosmogony remains essentially unaltered, all the existing cosmological models will turn out to be incorrect. In the present paper a study is reported of possible types of behaviour of the metagalaxy which will be admissible in the event of this actually occurring. An analysis is carried out within the framework of the general theory of relativity. The discussion is based on the results obtained by A. L. Zel'manov (Tr. VI soveshchaniya po voprosam kosmogonii [Proceedings of the 6th Conference on Cosmogony], Izd-vo AN SSSR, Moscow, 1959) and conditions are elucidated which are necessary for Zel'manov's solutions to hold (Dokl. AN SSSR, 135, No.6, 1960). It is assumed that the part of the universe which is accessible to observation may be regarded as

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a single elementary hydrodynamic particle, since according to present information it may be considered that its velocity field is relatively isotropic and uniform. It is shown that the lower limit for the angular velocity of absolute rotation of the metagalaxy is given by

$$\Omega_0 \geq \frac{c}{2} \sqrt{\kappa \rho_0 \theta} \quad (10)$$

where  $\theta$  is the ratio of the minimum value (during the preceding  $2 \times 10^{10}$  years) of the average diameter of galaxies and the present average distance between the galaxies,  $\kappa$  is Einstein's gravitational constant ( $8\pi G/c^2$ ),  $c$  is the fundamental velocity and  $\rho_0$  is the density of matter for a unit scale factor  $R$ . In fact, the rotation of the metagalaxy is an inescapable conclusion of this analysis. Finally, if the anisotropy in the deformation of the corresponding space is neglected, then it turns out that a singular state in the presence of rotation is impossible. Possible regular minima in the scale factor  $R$  of the universe surrounding us are then briefly explored.

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